

1310629

# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

*April 19, 2005*

**THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.**

**APPLICATION NUMBER: 60/552,653**

**FILING DATE: *March 13, 2004***

**RELATED PCT APPLICATION NUMBER: *PCT/US05/08297***



Certified by

Under Secretary of Commerce  
for Intellectual Property  
and Director of the United States  
Patent and Trademark Office

17224 U.S. PTO  
031304

PTO/SB/16 (01-04)

Approved for use through 07/31/2006. OMB 0651-0032

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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**PROVISIONAL APPLICATION FOR PATENT COVER SHEET**

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. ER009822423US

2154 U.S. PTO  
607552653

031304

INVENTOR(S)					
Given Name (first and middle (if any))		Family Name or Surname		Residence (City and either State or Foreign Country)	
David Brian		Jackson		Spanish Fork, Utah County, Utah	
Additional inventors are being named on the _____ 0 _____ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (500 characters max)					
System and Method of Managing and Monitoring Cluster Resources					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
<input type="checkbox"/> Customer Number: _____					
OR					
<input checked="" type="checkbox"/> Firm or Individual Name		Law Office of Thomas M. Isaacson			
Address		850 Lindy Lane			
Address					
City	Huntingtown	State	MD	Zip	20639
Country	USA	Telephone	410-414-3056	Fax	410-414-1433
ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification Number of Pages 4		<input checked="" type="checkbox"/> 2 CD(s), Number CD Listing			
<input type="checkbox"/> Drawing(s) Number of Sheets		<input checked="" type="checkbox"/> Other (specify) postcard receipt			
<input checked="" type="checkbox"/> Application Data Sheet. See 37 CFR 1.76					
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT					
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.				FILING FEE Amount (\$)	
<input checked="" type="checkbox"/> A check or money order is enclosed to cover the filing fees.				80.00	
<input type="checkbox"/> The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: _____					
<input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.					
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.					
<input checked="" type="checkbox"/> No.					
<input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are: _____					

[Page 1 of 2]

Respectfully submitted,

SIGNATURE Thomas M. Isaacson

TYPED or PRINTED NAME Thomas M. Isaacson

TELEPHONE 410-414-3056

Date March 12, 2004

REGISTRATION NO. 44166

(if appropriate)

Docket Number: 010-0010P

**USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT**

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop Provisional Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:	:	
David Jackson	:	
Serial No.: Not assigned yet	:	Art Unit:
Filed: 03/12/2004	:	Examiner:
FOR: SYSTEM AND METHOD OF	:	
MANAGING AND MONITORING	:	
CLUSTER RESOURCES	:	

**37 C.F.R. 1.54(e) CD LISTING OF DOCUMENTS**

Mail Stop: Provisional Patent Application  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

As required by 37 C.F.R. 1.54(e), the attached CDs include the following documents. Each compact disc is created in the IBM-PC format using the MS-Windows XP operating system. The following table provides a list of files with their names, dates of creation, size in bytes and creating program.

**CD LISTING OF DOCUMENTS**

Item # (Item may be folder or document)	Title	Contained in Folder	Size in Bytes	Date of Creation	Document Type
1	CD-Docket-No-010-0010P	CD	5.71 MB	3/12/2004	Folder
2	Configure.doc	CD-Docket-No-010-0010P	14 KB	3/12/2004	MS-Word
3	Makefile.in.doc	CD-Docket-No-010-0010P	1 KB	3/12/2004	MS-Word
4	README.doc	CD-Docket-No-010-0010P	2 KB	3/12/2004	MS-Word
5	contrib	CD-Docket-No-010-0010P	185 KB	3/12/2004	folder
6	appsim	CD-Docket-No-010-0010P/contrib	29.6 KB	3/12/2004	folder
7	BenchMark.c	CD-Docket-No-010-0010P/contrib/appsim	4 KB	3/12/2004	C-code file in notepad
8	LocalStage.c	CD-Docket-No-010-0010P/contrib/appsim	11 KB	3/12/2004	C-code file in notepad
9	Net1.c	CD-Docket-No-010-0010P/contrib/appsim	13 KB	3/12/2004	C-code file in notepad
10	SCHSMSim.c	CD-Docket-No-010-0010P/contrib/appsim	4 KB	3/12/2004	C-code file in notepad
11	AussieCheckReq.c	CD-Docket-No-010-0010P/contrib/checkreq	2 KB	3/12/2004	C-code file in notepad
12	ASCBbackgroundJobPolicy.c	CD-Docket-No-010-0010P/contrib/appsim	4 KB	3/12/2004	C-code file in notepad
13	The Binder and GI Subsystem Framework	CD-Docket-No-010-0010P/contrib/fairness	1 KB	3/12/2004	C-code file in notepad
14	JobLength.c	CD-Docket-No-010-0010P/contrib/fairness	7 KB	3/12/2004	C-code file in notepad
15	AussieJobInit.c	CD-Docket-No-010-0010P/contrib/jobinit	2 KB	3/12/2004	C-code file in notepad
16	randjob.c	CD-Docket-No-010-0010P/contrib/jobinit	4 KB	3/12/2004	C-code file in notepad
17	OSCPximityNodeAlloc.c	CD-Docket-No-010-0010P/contrib/nodeallo cation	4 KB	3/12/2004	C-code file in notepad
18	PNNLGetNodePriority.c	CD-Docket-No-010-0010P/contrib/nodeallo cation	2 KB	3/12/2004	C-code file in notepad
19	PNNLMachinePriority.c	CD-Docket-No-010-0010P/contrib/nodeallo cation	2 KB	3/12/2004	C-code file in notepad
20	Notify.hpc2n.doc	CD-Docket-No-010-0010P/contrib/scripts	1 KB	3/12/2004	MS-Word
21	Makefile.doc	CD-Docket-No-010-0010P/contrib/stats	1 KB	3/12/2004	MS-Word
22	Mprof.c	CD-Docket-No-010-0010P/contrib/stats	58 KB	3/12/2004	C-code file in notepad
23	Status.gif	CD-Docket-No-010-0010P/contrib/UI	51.9 KB	3/12/2004	GIF - image
24	Checkjob.1.doc	CD-Docket-No-010-0010P/docs	2 KB	3/12/2004	MS-Word

25	Moabdocs.html	CD-Docket-No-010-0010P/docs	3 KB	3/12/2004	HTML document
26	README.doc	CD-Docket-No-010-0010P/docs	1 KB	3/12/2004	MS-Word
27	Releaseres.1.doc	CD-Docket-No-010-0010P/docs	2 KB	3/12/2004	MS-Word
28	Runjob.1.doc	CD-Docket-No-010-0010P/docs	2 KB	3/12/2004	MS-Word
29	Schedctl.1.doc	CD-Docket-No-010-0010P/docs	3 KB	3/12/2004	MS-Word
30	Setres.1.doc	CD-Docket-No-010-0010P/docs	4 KB	3/12/2004	MS-Word
31	Showbf.1.doc	CD-Docket-No-010-0010P/docs	3 KB	3/12/2004	MS-Word
32	Showconfig.1.doc	CD-Docket-No-010-0010P/docs	2 KB	3/12/2004	MS-Word
33	Showq.1.doc	CD-Docket-No-010-0010P/docs	2 KB	3/12/2004	MS-Word
34	Showres.1.doc	CD-Docket-No-010-0010P/docs	3 KB	3/12/2004	MS-Word
35	Showstate.1.doc	CD-Docket-No-010-0010P/docs	2 KB	3/12/2004	MS-Word
36	Include-header-files (this folder contains 40 header files in wordpad)	CD-Docket-No-010-0010P/include-header-files	342 KB	3/12/2004	folder
37	Moab.cfg.sim.tmpl.doc	CD-Docket-No-010-0010P/samples	2 KB	3/12/2004	MS-Word
38	Moab.cfg.tmpl.doc	CD-Docket-No-010-0010P/samples	2 KB	3/12/2004	MS-Word
39	Tellme.tmpl.doc	CD-Docket-No-010-0010P/samples	1 KB	3/12/2004	MS-Word
40	Source-code (this folder containing further folders of source code files - see below)	CD-Docket-No-010-0010P/source-code	4.18 MB	3/12/2004	folder
41	Mcom (this folder contains 8 C-code files and one MS-Word Makefile.doc)	CD-Docket-No-010-0010P/source-code/mcom	238 KB	3/12/2004	folder
42	Mg2 (this folder 36 C-code files and one MS-Word Makefile.doc)	CD-Docket-No-010-0010P/source-code/mg2	380 KB	3/12/2004	folder
43	Moab (this folder contains 38 C-code files and one MS-Word Makefile.doc)	CD-Docket-No-010-0010P/source-code/moab	2.78 MB	3/12/2004	folder
44	Mirmi (this folder contains 8 C-code files and one MS-Word Makefile.doc)	CD-Docket-No-010-0010P/source-code/mirmi	395 KB	3/12/2004	folder
45	Msu (this folder contains 12 C-code files and one MS-Word Makefile.doc)	CD-Docket-No-010-0010P/source-code/msu	210 KB	3/12/2004	folder
46	Server (this folder contains 3 C-code files and one MS-Word Makefile.doc)	CD-Docket-No-010-0010P/source-code/server	209 KB	3/12/2004	folder
47	Resource.Trace1.doc	CD-Docket-No-010-0010P/traces	46 KB	3/12/2004	MS-Word
48	Workload.Trace1.doc	CD-Docket-No-010-0010P/traces	949 KB	3/12/2004	MS-Word
49	010-0010P-Appendix-A-for-Provisional.doc	CD	3.4 MB	3/12/2004	MS-Word
50	CD-Docket-No-010-0010P-	CD	973 KB	3/12/2004	folder

	Silver (this folder contains various files and folders containing C-code and header files and other documents)				
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Respectfully submitted,

Date: 3/2/04



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## **SYSTEM AND METHOD OF MANAGING AND MONITORING CLUSTER RESOURCES**

### **BACKGROUND OF THE INVENTION**

#### **1. Field of the Invention**

[0001] The present invention relates to a resource management system and more specifically to a system and method of managing and monitoring cluster resources.

#### **2. Introduction**

[0002] Managers of clusters desire maximum return on investment often meaning high system utilization and the ability to deliver various qualities of service to various users and groups. A cluster is typically defined as a parallel computer that is constructed of commodity components and runs as its system software commodity software. A cluster contains nodes each containing one or more processors, memory that is shared by all of the processors in the respective node and additional peripheral devices such as storage disks that are connected by a network that allows data to move between nodes.

[0003] The managers of such clusters need to understand how the available resources are being delivered to the various users over time and need the ability to have the administrators tune 'cycle delivery' to satisfy the current site mission objectives.

[0004] How well a scheduler succeeds can only be determined if various metrics are established and a means to measure these metrics are available. While statistics are important, their value is limited unless optimal statistical values are also known for the current environment including workload, resources, and policies. If one could determine that a site's typical workload obtained an average queue time of 3 hours on a particular system, this would be a good statistic. However, if one knew that through proper tuning, the system could deliver an average queue time of 1.2 hours with minimal negative side effects, this would be valuable knowledge.

[0005] The present invention was developed to address these issues. At its core, it is a tool designed to truly manage cluster resources and provide meaningful information about what is actually happening on the system. It was created to satisfy real-world needs of a batch system administrator as he or she tries to balance the needs of users, staff, and managers.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0006] In order to describe the manner in which the above-recited and other advantages and features of the invention can be obtained, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments thereof which are illustrated in the appended documents and drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings. These drawings are found in the various documents found in the attached Appendices and will be referred to and explained in the respective document which includes the drawing.

#### **DETAILED DESCRIPTION OF THE INVENTION**

[0007] The details of the present invention will be understood with reference to the associated documents attached as Appendix A hereto and further includes a CD according to 37 C.F.R. 1.54(e) and 1.96. There are two copies of the CD (Copy 1 and Copy 2). Each copy contains the same identical set of documents. The enclosed CD Listing of Documents will set forth the documents and folders on the CD with an accompanying explanation of the subject matter of each document. Each document contained on the CDs is incorporated herein by reference into this patent application.



[0008] Embodiments within the scope of the present invention may also include computer-readable media for carrying or having computer-executable instructions or data structures stored thereon. Such computer-readable media can be any available media that can be accessed by a general purpose or special purpose computer. By way of example, and not limitation, such computer-readable media can comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code means in the form of computer-executable instructions or data structures. When information is transferred or provided over a network or another communications connection (either hardwired, wireless, or combination thereof) to a computer, the computer properly views the connection as a computer-readable medium. Thus, any such connection is properly termed a computer-readable medium. Combinations of the above should also be included within the scope of the computer-readable media.

[0009] Computer-executable instructions include, for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing device to perform a certain function or group of functions. Computer-executable instructions also include program modules that are executed by computers in stand-alone or network environments. Generally, program modules include routines, programs, objects, components, and data structures, etc. that perform particular tasks or implement particular abstract data types. Computer-executable instructions, associated data structures, and program modules represent examples of the program code means for executing steps of the methods disclosed herein. The particular sequence of such executable instructions or associated data structures represents examples of corresponding acts for implementing the functions described in such steps.

[0010] Those of skill in the art will appreciate that other embodiments of the invention may be practiced in network computing environments with many types of computer

Attorney Docket: 010-0010P

system configurations, including personal computers, hand-held devices, multi-processor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, and the like. Embodiments may also be practiced in distributed computing environments where tasks are performed by local and remote processing devices that are linked (either by hardwired links, wireless links, or by a combination thereof) through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

**The Law Office of Thomas M. Isaacson**  
Intellectual Property Law

**APPLICATION DATA SHEET**

**Applicant Information**

Application Type: Provisional  
Subject Matter: Utility  
CD-ROM or CD-R: Yes  
Title: **SYSTEM AND METHOD OF MANAGING  
AND MONITORING CLUSTER RESOURCES**  
Attorney Docket Number: 010-0010P  
Total Drawing Sheets:  
Small Entity: Yes

**Applicant Information**

Applicant Authority Type: Inventor  
Status: Full Capacity  
Given Name: David  
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State: Utah  
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**Related Patent Application Information**

<b>Docket No.:</b>	<b>Type:</b>	<b>Parent Application</b>	<b>Filing Date</b>
010-0010P	Provisional		March 12, 2004

# Document made available under the Patent Cooperation Treaty (PCT)

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Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland  
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse